

# Physical Science

## Quarter 1 – Module 12:

### Active Ingredient(s) of Cleaning Products Used at Home



**Physical Science**

**Alternative Delivery Mode**

**Quarter 1 – Module 12: Active Ingredient(s) of Cleaning Products Used at Home**

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# **Physical Science**

## **Quarter 1 – Module 12:**

### **Active Ingredient(s) of Cleaning Products Used at Home**

# Introductory Message

For the facilitator:

Welcome to the Physical Science 11 Alternative Delivery Mode (ADM) Module on Active Ingredient(s) of Cleaning Products Used at Home!

This module was collaboratively designed, developed and reviewed by educators both from public and private institutions to assist you, the teacher or facilitator in helping the learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling.

This learning resource hopes to engage the learners into guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st century skills while taking into consideration their needs and circumstances.

In addition to the material in the main text, you will also see this box in the body of the module:



## ***Notes to the Teacher***

This contains helpful tips or strategies that will help you in guiding the learners.

As a facilitator you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

Welcome to the Physical Science 11 Alternative Delivery Mode (ADM) Module on Active Ingredient(s) of Cleaning Products Used at Home!

The hand is one of the most symbolized part of the human body. It is often used to depict skill, action and purpose. Through our hands we may learn, create and accomplish. Hence, the hand in this learning resource signifies that you as a learner is capable and empowered to successfully achieve the relevant competencies and skills at your own pace and time. Your academic success lies in your own hands!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:



***What I Need to Know***

This will give you an idea of the skills or competencies you are expected to learn in the module.



***What I Know***

This part includes an activity that aims to check what you already know about the lesson to take. If you get all the answers correct (100%), you may decide to skip this module.



***What's In***

This is a brief drill or review to help you link the current lesson with the previous one.



***What's New***

In this portion, the new lesson will be introduced to you in various ways such as a story, a song, a poem, a problem opener, an activity or a situation.



***What is It***

This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.



***What's More***

This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.



***What I Have Learned***

This includes questions or blank sentence/paragraph to be filled into process what you learned from the lesson.



***What I Can Do***

This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.



### **Assessment**

This is a task which aims to evaluate your level of mastery in achieving the learning competency.



### **Additional Activities**

In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.



### **Answer Key**

This contains answers to all activities in the module.

At the end of this module you will also find:

### **References**

This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

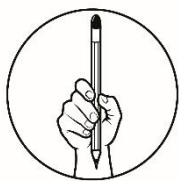


## ***What I Need to Know***

This module was designed and written with you in mind. It is here to help you master the active ingredients of cleaning products used at home. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

Knowledge of chemicals used on the different household cleaning products is very important. On this module, it focuses on the identification of the active ingredient(s) of cleaning products used at home.

After going through this module, you are expected to identify the active ingredient(s) of cleaning products at home.



## ***What I Know***

Pre-test. Write the chosen letter on a separate sheet of paper.

1. This is the type of cleaning products which many of the ingredients can be manufactured from plants.
  - a. astringent
  - b. bleaches
  - c. detergent products
  - d. dishwashing liquid
2. Most of the cleaning materials have active ingredients but different materials, what bleaching agent contains active ingredient that can remove stains?
  - a. chlorine
  - b. magnesium
  - c. potassium
  - d. sulfur
3. This cleaning product provides the chemical energy to help clean and remove food soil from different types of cooking and serving items.
  - a. astringent
  - b. bleaches
  - c. detergent products
  - d. dishwashing liquid
4. A cleaning agent that helps to disinfect and sanitize the materials and furniture in our home.
  - a. astringent
  - b. bleaches
  - c. detergent products
  - d. dishwashing liquid
5. To keep us healthy, the main function of this item is to prevent the spread of infectious diseases and control allergens.
  - a. cleaning product
  - b. cooking utensils
  - c. electrical appliances
  - d. vehicles
6. What kind of household cleaning product that is used for cleaning dishes, plastics, and many other surfaces?
  - a. astringent
  - b. bleaches
  - c. detergent products
  - d. dishwashing liquid



7. Sodium hydroxide and \_\_\_\_\_ are the most commonly used alkali in soap and detergents.
- calcium hydroxide
  - carbon hydroxide
  - magnesium hydroxide
  - potassium hydroxide
8. A kind of cleaning material that is used for hand washing of glasses, plate, cutlery, and cooking utensils in a sink or bowl.
- astringent
  - dishwashing liquid
  - bleach
  - detergent products
9. Mixing chlorine bleach with ammonia or vinegar can release what kind of poisonous gas?
- carbon
  - chlorine
  - potassium
  - sodium
10. This is a reducing bleach that works by changing the double bonds of a chromosphere into single bonds.
- increasing bleach
  - non-oxidizing bleach
  - oxidizing bleach
  - reducing bleach
11. Cleaning your home is very important. It includes scrubbing, removing of dust, grease, and \_\_\_\_\_.
- clothes
  - furniture
  - food waste
  - shoes
12. In using cleaning products, one must remember some precautionary measures. Choose the best answer.
- Read the instructions carefully before using the product.
  - Wear appropriate protective equipment when using the product.
  - A and B only
  - B only
13. Active ingredient in a cleaning product is the strong mineral acid and chalcant. Which of the following is not a mineral acid?
- hydrochloric acid
  - nitric acid
  - sulphuric acid
  - carbonic acid
14. In order to attain a better and healthy living, one must practice proper hygiene and one of it is the handwashing. What will you use to perform a good

handwashing?

- a. detergent
- b. dishwashing liquid
- c. bacterial soap
- d. wax

15. In order to prevent any harm in using the cleaning products at home, one must:

- a. Buy one product only.
- b. Read carefully the product information.
- c. Patronize the most popular name of a product.
- d. Check the cheapest product available in the market.

## Lesson

# 1

## Active Ingredient(s) of Cleaning Materials Used at Home

Home is our haven especially when we are so tired in our whole day work in school or office. In this time of pandemic, the cleanliness of our home is very important. Good housekeeping requires high standard of cleanliness or the absence of dirt and its sanitation as well, or the absence of disease-causing organisms like bacteria. All housekeeping tasks need the use of the right tool for the right job.

No single product can provide optimum performance on all surfaces and all soils. It is not surprising that many different household cleaners are available in the market. They are formulated to clean efficiently and conveniently in many different situations found at home.



### ***What's In***

#### **Activity 1.1**

Chemical reaction occurs when there is enough energy between reactants and creates products. The reaction can increase or decrease temperature which is one of the reasons that cleaning household products can burn skin or cause irritation.

1. What are the things you already know about the following concepts?
2. In what way will the following concepts be useful in understanding how chemical household cleaning products works effectively. Give a possible explanation.

- a. Energy
- b. Chemical reactions

Let us see how these concepts occur in our lesson.

*Note:* Be careful on handling household cleaning products.



### ***Notes to the Teacher***

Let the learner look for the cleaning products available in their home that will be used in the activity. Instruct the learner to be very careful in handling the household cleaning products.



## ***What's New***

### **Activity 1.2 Fruity Agents**

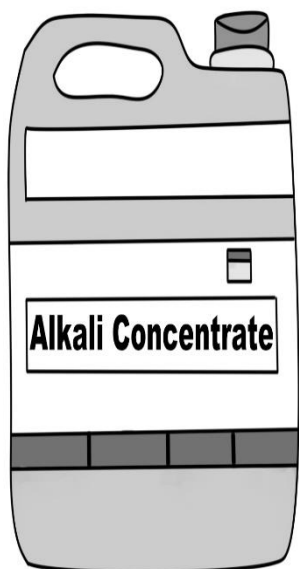
Direction: Aside from being our food, give the other use of these fruits/vegetables. Explain why these fruits/vegetables could be useful as cleaning materials or agents.

“Fruits/ Vegetables as Cleaning Agents”

| Fruits/vegetables | Use |
|-------------------|-----|
| 1. calamansi      |     |
| 2. lemons         |     |
| 3. papaya         |     |
| 4. tomatoes       |     |
| 5. potatoes       |     |



## ***What is It***



### **Active Ingredients of Cleaning Products Used at Home**

There are lots of cleaning products we use daily in our home, office, or school. These cleaning products play an important vital role in order to make our home spick and span. They also help in safely and effectively removing dirt, germs and other contaminants. They can also prevent the spread of infectious diseases and control allergens, such as dust and mold, in order to keep us healthy. Cleaning products also enable us to care for our homes and possessions.

There are different kinds of cleaning products. These are laundry detergents, bleaches, dishwashing products and other household cleaners. Active ingredients are found in different household cleaning products. They may give different side

effects to human. They can give either positive or negative side effects to us. So before using these cleaning materials be sure to read first the instructions. Don't forget to follow all precautionary and safety measures before using them. Here are some of the active ingredients found in different cleaning materials we use at home.

### 1. Alcohol Ethoxylate (AE)

Alcohol ethoxylates are a class of compounds that are commonly used throughout many industrial practices and commercial markets. These compounds are synthesized via the reaction of a fatty alcohol and ethylene oxide, resulting in a molecule that consists of two main components, (1) the oleophilic, carbon-rich, fatty alcohol and (2) the hydrophilic, polyoxymethylene chain.

Alcohol ethoxylate surfactants enhance the mixing and solubilization of oil and water by having these contrasting sections within the same compound. With this unique structure, a single molecule can inhabit the interface of two immiscible phases (i.e. oil and water), effectively bringing them closer together and lowering the interfacial energy associated between them.

Because these compounds are surfactants, they can be used whenever oily substances encounter water or a surface. It can be used as detergents, wetting agents, emulsifiers, degreasers and emollients in many lines of commercially available products and industrial practices.

### 2. Sodium Alkyl Sulfates

Sodium alkyl sulfate are members of alkyl sulfates. They are water-soluble and can form soap bubbles. The chemical formula is  $C_nH_{2n+1}OSO_2ONa$ .

It can be used in detergents, dish washing liquids, shower gels, shampoos, hair conditioners and fabric softeners. It can also be used as fire extinguishing agent, because it is not flammable. In the cosmetic industry it is used as an emulsifier to mix oily and water-soluble compounds for toothpaste or moisturizing products.

It can produce irritating vapors when heated, consisting of carbon dioxide, carbon monoxide, sulfur dioxide and others. As all detergents it can irritate skin and eyes. If swallowed, it will cause nausea or vomiting.

### 3. Amine Oxide

An amine oxide, also known as amine-N-oxide and N-oxide, is a chemical compound that contains the functional group  $R_3N^+-O^-$ , an N-O bond with three additional hydrogen and/or hydrocarbon side chains attached to Long-chain alkyl amine oxides are used as nonionic surfactants and foam stabilizers.

Amine oxides are highly polar molecules and have a polarity close to that of quaternary ammonium salts. Small amine oxides are very hydrophilic and have an excellent water solubility and a very poor solubility in most organic solvents.

### 4. Ammonia

Ammonia is a colorless, *soluble alkali gas* that occurs naturally in the environment. It is a chemical containing *one nitrogen and three hydrogen* atoms bonded together. It was traditionally used in many household cleaners, though today it's still found in glass cleaner, all-purpose cleaners, and smelling salts. When used in cleaning compounds, it's called "*household ammonia*."

Ammonia fumes are powerful irritant, potentially harming your skin, eyes, nose, lungs and throat. When found in oven cleaners and window cleaning formulations, it is an irritant to the mucous membranes. When working with ammonia, wearing heavy-duty gloves, goggles, and a face mask are smart precautions to protect your health.

#### 5. Sodium hypochlorite

Sodium hypochlorite also known as bleach is another *alkali disinfectant*. Bleach works by oxidizing or breaking down the molecular bonds of stains and germs.

Another useful but dangerous cleaner it also has strong corrosive properties that may do serious damage to the human body. Ammonia and bleach are a particularly dangerous combination, creating potentially deadly gases when mixed. Never store these two chemicals in the same place.

Bleach in the bottle is generally a five percent solution. Toxic chlorine gas can be formed if bleach is mixed with acids, such as bowl cleaners.

#### 6. Ethanol

Ethanol is a natural byproduct of plant fermentation and can be produced through the hydration of ethylene. It mixes easily with water and many organic compounds, and makes an effective solvent for use in paints, lacquers and varnish, as well as personal care and household cleaning products.

Ethanol is highly flammable and should not be used near open flames. Ethanol inhalation can cause coughing or headaches.

#### 7. Phenol

Phenol, any of a family of organic compounds characterized by a hydroxyl ( $\text{—OH}$ ) group attached to a carbon atom that is part of an aromatic ring. Besides serving as the generic name for the entire family, the term *phenol* is also the specific name for its simplest member, monohydroxybenzene ( $\text{C}_6\text{H}_5\text{OH}$ ), also known as benzenol, or carbolic acid.

Phenols are similar to alcohols but form stronger hydrogen bonds. They are more soluble in water than are alcohols and have higher boiling points. Phenols occur either as colorless liquids or white solids at room temperature and may be highly toxic and caustic.

Phenols are widely used in household products and as intermediates for industrial synthesis. For example, phenol itself is used (in low concentrations) as a disinfectant in household cleaners and in mouthwash. Phenol may have been the first surgical antiseptic. In 1865 the British surgeon *Joseph Lister* used phenol as an antiseptic to sterilize his operating field.

#### 8. Quaternary ammonium

The quaternary ammonium compounds (or quats) are a family of low-level disinfectants (according to Spaulding) with most quats being derived from benzalkonium. Quats are reacted to provide a variety of chain lengths and molecular structures so that the mix of quats used in the disinfectant provide a wider range of efficacy than a single chain.

Quats are generally used to disinfect countertops, toilets and other high touch environmental surfaces and floors. Quaternary ammonium compounds are cationic disinfectants. This means the quats chain carries a positive (plus) charge on one end of the molecule; many soils and soaps/detergents carry an anionic or negative (minus) charge.

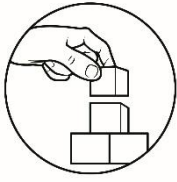
Quats can also bind with, or be absorbed by, materials and fibers including cotton (e.g., cleaning rags and mops). Quats generally take 3-10 minutes to disinfect and should be used with cleaning tools that are tested to be compatible.

#### *9. Sodium percarbonate.*

Sodium percarbonate is a powder that releases hydrogen peroxide, and very concentrated. It is a granulated powder which can be nice for scrubbing stains and stuck-on-gunk off dishes. Scouring powder is made from hydrogen peroxide. It can be made into a paste, too, and used on tile grout and tough stains.

In using this product, follow and read the instructions carefully. Be very careful in handling all household cleaning products.





## ***What's More***

### **Activity 1.3 Product Exploration**

**Direction:**

With your cleaning products available at hand, read the product information on the packaging. Fill out what is ask on the table below using the product information. During the activity, observe the products with caution, particularly in smelling and touching as they may have harmful effects upon contact. Write your answer on a separate sheet.

| Product   | Product Description | Active/Major Ingredient | Guidelines in using the product | Precautions in using the product |
|---|---------------------|-------------------------|---------------------------------|----------------------------------|
| Bleach<br>(DO NOT TOUCH with BARE HANDS)              |                     |                         |                                 |                                  |
| Detergent soap  |                     |                         |                                 |                                  |
| Dishwashing liquid                                    |                     |                         |                                 |                                  |
| Toilet bowl cleaner<br>(DO NOT TEACH with BARE HANDS) |                     |                         |                                 |                                  |

After filling up the table, check the common active ingredients present in all cleaning products.



## ***What I Have Learned***

### **Activity 1.4 Product Discovery**

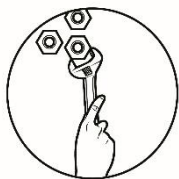
Direction:

1. With the following ingredients, specify their use as household cleaning materials.
  - a. garlic
  - b. onion
  - c. salt
  - d. vinegar
2. What properties they possessed to be considered as cleaning products.

“Ingredients as Household Cleaning Products”

| Ingredients | Uses | Properties |
|-------------|------|------------|
| garlic      |      |            |
| onion       |      |            |
| salt        |      |            |
| vinegar     |      |            |

3. Explain why these are useful not only as ingredients but also as household cleaning products.
4. Take all the necessary care in doing the activity.
5. Wear necessary gears in performing the activity.
6. Write your output in a separate sheet of paper.

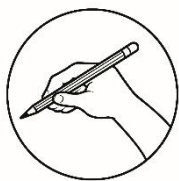


## ***What I Can Do***

### **Activity 1.5**

Direction:

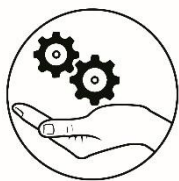
1. What are the alternative natural materials can be used in cleaning the following:
  - a. food stain on clothes
  - b. kitchen sink
  - c. bad smell/odor inside refrigerator
2. Give your opinion why these alternative materials can be used as household cleaning material.
3. Write your answer on a separate sheet of paper.



## Assessment

Direction: Write T if statement is *true* and F if the statement is *false* and choose the word or set of words that make it incorrect. Write your answers on a separate sheet of paper.

1. Sodium percarbonate is a granulated powder that can be used in scrubbing stains.
2. Alcohol Ethoxylate are being synthesized through the reaction of a fatty alcohol and ethylene oxide.
3. Quaternary ammonium are compounds that belong to the family of high-level disinfectants.
4. Sodium alkyl sulfate are water-soluble sulfates that can form soap bubbles.
5. Phenols form stronger hydrogen bonds and more soluble in water than alcohols.
6. Small amine oxides are very hydrophilic and have an excellent water solubility.
7. Bleach is the other name for sodium hypochlorite.
8. Alcohol ethoxylate is an alkyl sulfate that enhances the mixing and solubilization of oil and water.
9. Quat is a powder that releases hydrogen peroxide which can be used for scrubbing stains.
10. Ethanol is a byproduct of plant fermentation and produced through the hydration of ethylene.
11. All cleaning agents can irritate skin and eyes and can cause nausea or vomiting if swallowed.
12. Ethanol is non-flammable, but inhalation can cause coughing or headaches.
13. Ammonia is a soluble alkali gas which contains one nitrogen and three hydrogen atoms bonded together.
14. Ethoxylate surfactants enhance the mixing and solubilization of oil and water.
15. Ammonia fumes are powerful irritants that can cause harm to your skin, eyes, nose, lungs and throat.



## ***Additional Activities***

### **Activity 1.6**

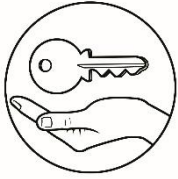
Direction:

Compose a jingle related to the topic active ingredients of cleaning agents. Write your output in a separate sheet of paper.

#### **Rubrics**

| <b>Criteria</b>             | <b>Excellent<br/>(4pts)</b>   | <b>Merit<br/>(3pts)</b>                       | <b>Achieved<br/>(2pts)</b>   | <b>Needs<br/>Improvement<br/>(1pt)</b>             | <b>Score</b> |
|-----------------------------|---|---|--|--|--------------|
| <b>Content</b>              | Information are clearly presented and ordered in such a way that it brings a full picture of the material | Information are clearly presented and ordered | Information is clear<br>Order of information does not clearly show | Information is unclear and written in random order |              |
| <b>Creativity</b>           | It is visually inviting and easy to read  | Visually inviting and easy to read            | Visually pleasing and readable                                     | Readable   |              |
| <b>Spelling and Grammar</b> | All spelling and grammar are correct  | Some spelling and grammar error               | Some spelling and grammar error                                    | Notable spelling and grammar error                 |              |
| <b>Punctuality</b>          | Submitted on time   | Submitted on time                             | Submitted on time  | Submitted after the deadline                       |              |
|                             |   |   |  | <b>TOTAL</b>                                       |              |

**Highest possible score: (4x4)/4= 4 components**



## ***Answer Key***

|  |   |  |
|--|---|--|
| <p><b>What I Know</b></p> <p>1. C<br/>2. A<br/>3. D<br/>4. C<br/>5. A<br/>6. D<br/>7. D<br/>8. B<br/>9. B<br/>10. D<br/>11. C<br/>12. C<br/>13. D<br/>14. C<br/>15. D</p>  | <p><b>What's More</b></p> <p>Answers may vary depending on the available cleaning products</p>  | <p><b>Assessment</b></p> <p>1. T<br/>2. T<br/>3. F- low<br/>4. T<br/>5. T<br/>6. T<br/>7. T<br/>8. F-alkyl sulfate<br/>9. F- Quat<br/>10. T<br/>11. T<br/>12. F- non-flammable<br/>13. T<br/>14. T<br/>15. T</p> |
| <p><b>What's In</b></p> <p>Use:<br/>Calamansi- bleach, removes stain and odor<br/>Lemon- antiseptic; natural bleach; removes odor<br/>Papaya- stain remover<br/>Tomatoes- clean metal<br/>Potato- removes rust<br/>Answers may vary.</p> | <p><b>What I have Learned</b></p> <p>Use:<br/>Garlic- disinfectant, cleaning tops<br/>Onion- removes rust<br/>Salt- scouring agent<br/>Vinegar- disinfectant, removes dirt and grease<br/>Properties:<br/>Garlic- allicin<br/>Onion- Sulphasillic acid<br/>Salt- ionic in nature<br/>Vinegar- acetic acid</p> | <p><b>Additional Activities</b></p> <p>Answer may vary depending on the available cleaning products</p>  |
| <p><b>What's New</b></p> <p>Answers may vary depending on the available fruits and vegetables.</p>   | <p><b>What I Can Do</b></p> <p>Answers may vary depending on the insight of the learner.</p>  |  |

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